

Semantic Interoperability and the FEA

A Briefing on Federal Information
Interoperability Examined in the
Context of DHS Issues and Challenges

Overview and Objectives



- ❑ Consider information sharing issues and problems within federal agencies
- ❑ Discuss Department of Homeland Security challenges as an example case
- ❑ Describe the 800-pound gorilla in the room: *emerging technologies generating the lion's share of hype today may not solve the most pressing barriers to long term information sharing successes*
- ❑ Itemize why recent technology innovations with process management and service-oriented architectures can not provide relief by themselves
- ❑ Start to describe why a technology infrastructure that provides semantic interoperability is our best viable long term path

...The Same, but Different



- ❑ Federal agencies share many of the same challenges as large commercial enterprises, but experience those challenges in different ways and to different degrees
- ❑ Some of the 'special' characteristics include:
 - ❑ Highly decentralized technology management
 - ❑ Sheer size and scope of infrastructure
 - ❑ Vastly different community cultures
 - ❑ Progress comes from negotiation – not mandate
 - ❑ Existence of 'watchdogs' – public nature of operations
 - ❑ Politics first, business second
- ❑ The result of these forces on federal enterprise architecture requires a different technical approach to information sharing
 - ❑ The above-mentioned constraints are real – not hypothetical or easily overcome by executive mandates and more dollars

Necessary but NOT Sufficient



- ☐ Hyped-up vendor and marketplace solutions provide some, but not all of the pieces of the puzzle
- ☐ Consider the DHS information sharing conundrum and the technologies that WILL NOT provide significant relief:
 - ☐ Data Warehouses
 - ☐ Service-Oriented Architectures
 - ☐ COTS Process Management
 - ☐ COTS Middleware
 - ☐ Portals
 - ☐ Programming Frameworks
 - ☐ Industry Standards
- ☐ Itemizing all the reasons each of these technologies will not solve DHS issues would take a while...
 - ☐ anybody have specific questions?

Requirements Summary



- ☐ To make information fluid and dynamic...
 - ☐ Biometrics
 - ☐ Wanted Persons, Alerts, Court Records
 - ☐ Firearms databases
 - ☐ DMV, Plates, Licenses, Address, Vehicle
 - ☐ Travelers – Airline, Trains, Bus
 - ☐ Transport – cargo and shipments
 - ☐ Vehicles – aircraft, boat, train, truck, auto
 - ☐ Criminal histories, FBI records, prison records
- ☐ Supporting digital formats such as...
 - ☐ Unstructured data – HTML, PDF, Word, Excel, Email...
 - ☐ Semi-structured data – EDI, delimited, tokenized, indexed, positional
 - ☐ Structured – relational, hierarchical, frame-based (Objects)

Requirements Summary (cont.)



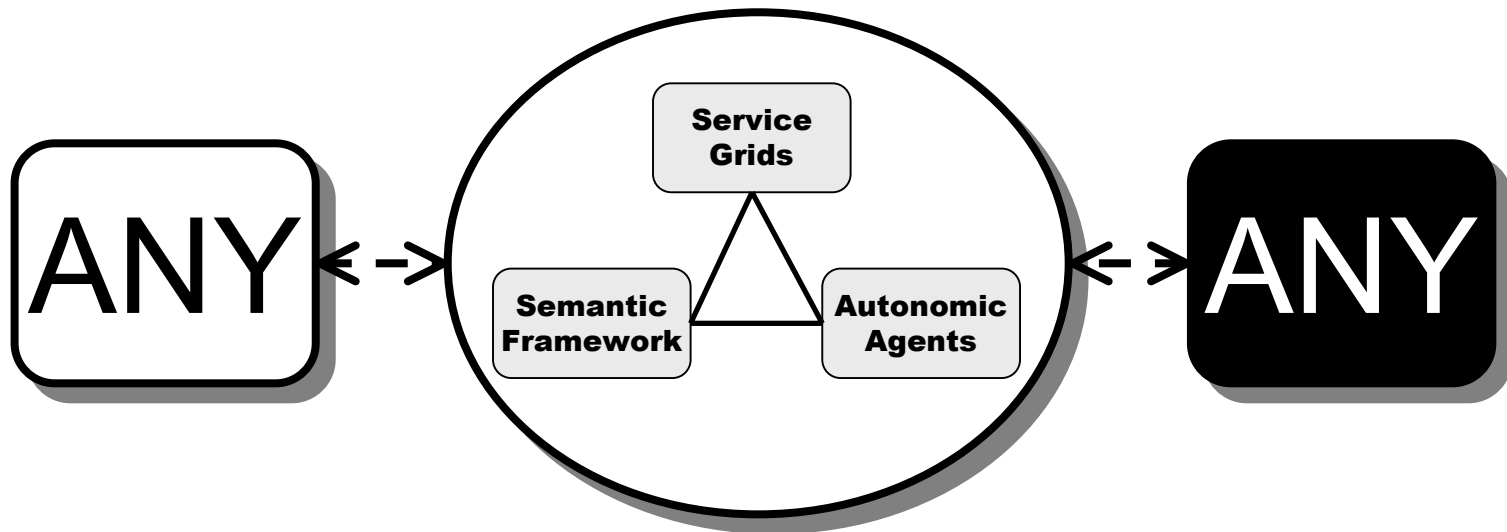
- ☐ From a diverse array of sources...
 - ☐ Federal (over 15 for DHS)
 - ☐ International (over 15)
 - ☐ State (300 or more)
 - ☐ Local (thousands)
 - ☐ Private (over 20)
- ☐ To provide functional capabilities like...
 - ☐ Analytics, visualization and reporting (eg: human interfaces)
 - ☐ Interoperability, query, and aggregation (eg: machine interfaces)
- ☐ While accommodating non-technical limitations...
 - ☐ Different cultures, jargon, vocabularies, operations
 - ☐ Entrenched IT infrastructures (not going anywhere soon)
 - ☐ Decentralized, politically motivated funding and management
 - ☐ Public watchdog and civil liberties concerns
 - ☐ Negotiation and compromise processes

Requirements Summary (cont.)



- ❑ And providing best-of-breed technical capabilities that...
 - ❑ Do not require a single, centralized, agency sponsor
 - ❑ Do not enable browsing or snooping into protected systems
 - ❑ Do not require vendor specific adapters or components
 - ❑ Do not require a single, massive community exchange
 - ❑ Do not hinge on a single database, vendor or technology

Solution: 30,000 feet

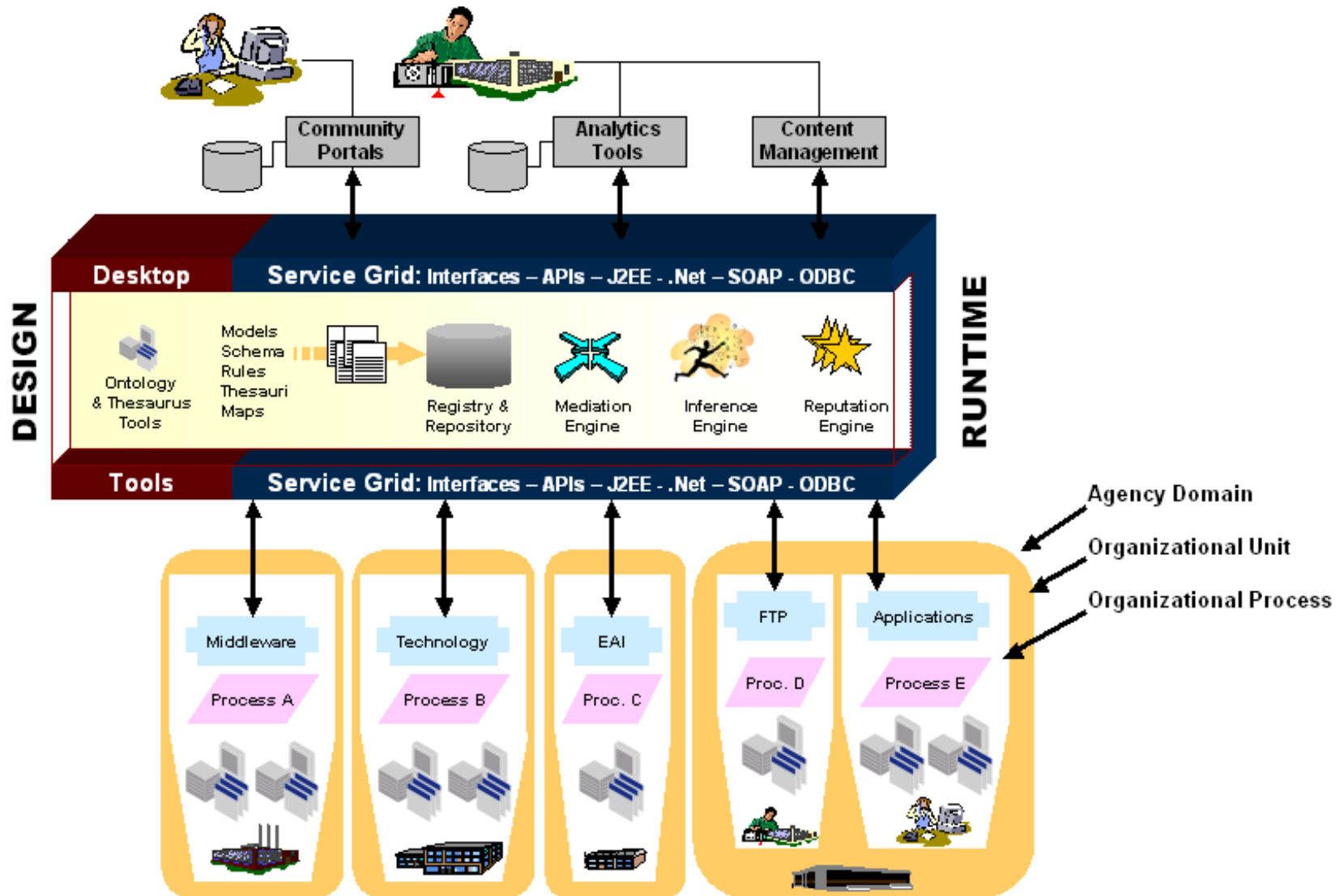


Solution: 20,000 feet



- ❑ Semantic Interoperability Framework
 - ❑ Multi-Modal approach (different tech at different layers)
 - ❑ Inferencing and description logics
 - ❑ Semantic mapping models
 - ❑ Information registry and thesaurus
 - ❑ Ontology modeling and model brokering
- ❑ Service Grids
 - ❑ Web services protocols
 - ❑ Component-based utilities and services
 - ❑ Advanced dynamic and decoupled networks (UDDI prime)
 - ❑ Multi-vendor and multi-topology support
- ❑ Autonomic Network Components
 - ❑ Multi-role agent-based technology
 - ❑ Self-configuring interfaces
 - ❑ Self-optimizing transactions
 - ❑ Self-cleansing data validation

Solution: 10,000 feet



Semantic Interoperability



- ❑ Foundational, core, capability
 - ❑ Dynamic services require semantic interoperability
 - ❑ Dynamic processes require semantic interoperability
 - ❑ Flexible information sharing requires semantic interoperability
 - ❑ Secure application grids require semantic interoperability
- ❑ Not the Semantic Web
 - ❑ Semantic web is broader, more focused on Internet data
 - ❑ Semantic web is likely a 7-10 year vision (vs. 3-5 year)
 - ❑ But they share some of the same technologies (OWL etc.)
- ❑ Provides solid answers to significant problems
 - ❑ Culture barriers across agencies (no vocabulary standards)
 - ❑ Decentralized IT management (opt-in and incremental)
 - ❑ Politics of negotiation (no mandates, only models and mappings)
 - ❑ Watchdogs (no central repository, only already legal access)
 - ❑ Sheer size and scope (dynamic responses to change)

Conclusions



- ❑ Not enough time here to go into the details, but...
 1. Agency architecture concerns are bigger, more complex and influenced by more difficult forces to manage than commercial counterparts
 2. This demands a more comprehensive, well-thought out long term infrastructure and architectural vision than commonly found in the commercial marketplace, standards and COTS vendors
 3. An infrastructure that synthesizes information semantics, service grids and autonomic agent capabilities into a cohesive, dynamic, and loosely-coupled whole is the single best bet for long term success
 4. These technical one-off capabilities ARE HERE TODAY, but still require assembly into an incrementally deployable government infrastructure

How to Proceed



- ☐ Design candidate frameworks
 - ☐ Networks and services
 - ☐ Models, ontology and taxonomy
 - ☐ Interfaces and capabilities
- ☐ Identify and score key technologies
 - ☐ Which technologies? (eg: model languages, engines, logic)
 - ☐ What maturity? (research, developmental, commercial)
 - ☐ Build or buy? (crucial, but non-commercial software)
- ☐ Build agency support
 - ☐ Market the potential benefits
 - ☐ Describe flexibility that agencies will have
- ☐ Implement a pilot
 - ☐ Designed to highlight key capabilities
 - ☐ Solve an actual problem
 - ☐ Demonstrate incremental roll-out potential

About



- ❑ Semantic Mesa is a small technology startup focused on advancing the momentum behind semantics-based tools, technologies and approaches that will serve the global IT community at large and the security of the nation in immediacy
- ❑ Jeffrey Pollock has held executive and senior architecture positions with leading technology companies like Modulant, Modem Media, and Ernst and Young LLP serving both federal and Fortune 500 clients.
- ❑ Currently Jeff is authoring a book titled “*Semantic Interoperability: Enterprise Integration and Applications*,” which will be published by John Wiley & Sons in Q1 2004

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